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Information processing system, information processing apparatus, information terminal, and method for control thereof

5 FIELD OF THE INVENTION

The present invention relates to an information processing system which includes a plurality of devices for radio communications, an information processing system comprising a global positioning system (GPS), and a method for controlling these systems.

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BACKGROUND OF THE INVENTION

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Recently in the communications field, radio communication technology and its devices are being offered at lower prices, and the information processing apparatus and system are widely being utilized for making radio communications between personal computers (PCs), between a PC and peripheral devices or between information terminals other than PCs, and for transmitting information and controlling devices.

In particular, as a result of the enhancement in the integration technology of electronic components, the development of small and high performance batteries and the development of new materials for use in the casing, the information processing apparatus is smaller in size and lighter in weight, and the information processing apparatus is further advanced in portability. Accordingly, the opportunities for digital radio communications between a portable device and a stationary device are increasing.

In such a manner of use, a portable device "A" sends an instruction to an installed device "B" by radio communication. The device "B" processes according to the instruction, and sends the result to the device "A". It seems as

if all operations were only done in the portable device "A".

In this conventional system, however, the device which is installed at a remote place may be stolen, or important data may be read, falsified, or erased surreptitiously.

5 Moreover, the portable device, which is smaller and lighter than a desktop computer, may be lost or stolen easily. In the same manner as in the case of the installed device, important data may be read, falsified, or erased surreptitiously.

10 SUMMARY OF THE INVENTION

In view of the above-described problems, it is therefore an object of the invention to provide an information processing system and apparatus and a method for controlling the system and apparatus to be capable of preventing surreptitious reading, falsifying and erasing of data.

15 For this purpose, in the event of a communication failure between information devices due to problems in radio communication systems or the like during information processing by using radio communications between the information devices, the data display and input operation in the information devices are stopped.

20 The information processing system of the present invention is an information processing system which contains an information processing apparatus having a radio transmitting and receiving unit, and an information terminal such as a portable device. A received wave strength measuring unit which measures the strength of a radio wave that is transmitted from the
25 information terminal and received in the information processing apparatus is provided in the information processing apparatus. The measuring unit allows the strength of the received radio wave to be judged (determined) of the

received radio wave is within a predetermined range or not. If the strength of the received radio wave is not within the predetermined range, an out-of-range informing signal is generated, and the function of the information processing apparatus is stopped, or the information processing apparatus may be locked
 5 (prohibited) from starting.

Also, by similarly providing a received wave strength measuring unit in the information terminal, the operation of the information terminal may be stopped or the information may be locked from starting.

Further, instead of the received wave strength measuring unit, a GPS
 10 receiver may be installed in either apparatus so that the present position of the either apparatus can be detected. While judging if the present position of the other apparatus is within a predetermined range or not, if the result shows that the other apparatus is out of the predetermined range, an out-of-range informing signal is generated. As a result, in the apparatus in which the GPS
 15 is provided, the operation of the other apparatus may be stopped or the other apparatus may be locked from starting.

Moreover, by transmitting a password by the radio transmitting and receiving unit, the information processing apparatus may be designed so as to start and stop the operation of the functions of the receiving side apparatus, or
 20 to start and stop the functions of both of the apparatuses totally.

Further a GPS receiver may be installed in a single device, and the present position of the device may be detected so as to judge whether the present position of the device is within a predetermined range or not from the other apparatus. Depending on the result, the device may be designed to start
 25 and stop the operation of the function of this apparatus, or to start and stop the functions of both of the apparatuses totally.

The apparatus control method includes steps corresponding to the

above-described modes of the information processing system and apparatus.

Thus, according to this information processing system and apparatus control method, if two information processing devices for mutual radio communications are not in the predetermined range, or if the received password
5 is not matched, the function of the apparatus is stopped, or both of the apparatuses is stopped from ever starting. Accordingly, the present invention prevents surreptitious reading, falsifying and erasing of the data that is stored in the apparatuses.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a block diagram of an information processing system according to a first embodiment of the present invention.

Fig. 1B is a block diagram of another example of the information processing system of the first embodiment of the present invention.

15 Fig. 2 is a flowchart showing the operation control method of the first embodiment of the present invention.

Fig. 3A is a block diagram of an information processing system according to a second embodiment of the present invention.

20 Fig. 3B is a block diagram of another example of the information processing system of the second embodiment of the present invention.

Fig. 4 is a flowchart showing the operation control method of the second embodiment of the present invention.

Fig. 5 is a block diagram of an information processing apparatus according to the third embodiment of the present invention.

25 Fig. 6 is a flowchart showing the operation control method embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, preferred embodiments of the present invention are described in detail below.

First Embodiment

5 Fig. 1 is a block diagram of an information processing system according to a first embodiment of the present invention.

 In Fig. 1A, an information processing apparatus 110 operating as a main controller generates an image signal by specified signal processing, and the information processing apparatus 110 transmits the image signal to an
10 information terminal 120, which is an image display device (display apparatus) by using a radio wave outputted from a first transmitting and receiving unit 113. The information terminal (display apparatus) 120 receives this radio wave in a second transmitting and receiving unit 121, decodes the radio wave into an image signal, and displays the signal as an image in a second display
15 unit 122.

 The first display unit 111 in the information processing apparatus 110 is a CRT, liquid crystal display (LCD), or the like. The displayed image is transmitted from the information processing apparatus 110 into the information terminal 120 without being changed or modified therebetween. A
20 first input unit 112 includes a keyboard and a mouse, and the first input unit 112 is manipulated by the user for input operations. A second input unit 123 of the information terminal 120 may similarly be manipulated by a user for input operations.

 The first transmitting and receiving unit 113 not only transmits the
25 image signal to the display apparatus 120 as mentioned above, but the first transmitting and receiving unit 113 also receives the operation signal from the display apparatus 120. The operation signal is generated by the user's input

manipulation in the second input unit 123. A radio field strength detector 114 measures the reception strength, at a predetermined time interval, when the radio wave that is transmitted from the display apparatus 120 is received in the information processing apparatus 110.

5 Based on the measuring result of the radio field strength detector 114, an out-of-range determining and informing unit 115 judges (determines) if the received radio wave strength is within a normal radio communication range for the information processing apparatus 110 and the display apparatus 120. If the received radio wave strength is out of the normal radio communication
10 range, the out-of-range determining and informing unit 115 judges that the display apparatus 120 is out of range, generates an out-of-range informing signal, and outputs the out-of-range informing signal to a locking unit 118. The locking unit 118 instructs that display be stopped and an invalidity of an input to a display controller 116 and an input controller 117. Responsive to the
15 instruction from the locking unit 118, the display controller 116 and the input controller 117 stop the display of the first display unit 111 and invalidate the input from the first input unit 112. At this time, alternatively, starting of the information processing apparatus 110 may be stopped.

 The first processing unit 119 processes the user's operation signal input
20 outputted from the first input unit 112 through the input controller 117, and the first processing unit 119 processes the user's operation signal input outputted from the second input unit 123 through the transmitting and receiving units 121 and 113. The first processing unit 119 generates image signals of a moving image, a still image and text, and outputs such generated
25 image signals to the first display unit 111 through the display controller 116.

 Receiving this image signal, a desired image is displayed in the first display unit 111.

This image signal is also transmitted to the display apparatus (information terminal) 120 through the first transmitting and receiving unit 113, and the same image is displayed in the second display unit 122 in the same manner as mentioned above.

5 The second transmitting and receiving unit 121 receives the image signal that is generated in the information processing apparatus 110, and transmits the operation signal that is generated in the display apparatus 120 by means of a radio wave.

 The second display unit 122 is an LCD or the like, and the second input
10 unit 123 is a touch panel or the like.

 The second processing unit 124 generates an image signal from the reception signal that is outputted from the second transmitting and receiving unit 121, and outputs the generated image signal to the second display unit 122 via the display controller 128. Also, the second processing unit 124 outputs the
15 operation signal to the second transmitting and receiving unit 121. The operation signal is generated by the user's input operation that is received in the second input unit 123.

 In the information processing system of the first embodiment, it is supposed that the information processing apparatus 110 is installed in a
20 specified place, and the information terminal 120 is carried, i.e., mobile, and is usually used in a place which is remote from the information processing apparatus 110.

 In the information processing system of the first embodiment having such a configuration as described above, the operation of the information
25 processing apparatus 110 after the radio field strength detector 114 measures the received radio wave strength is explained according to the flowchart shown in Fig. 2.

Step 201:

The radio field strength detector 114 measures the radio wave strength and evaluates the radio wave strength as, for example, “L”. Then, the process proceeds to step 202.

5 Step 202:

The out-of-range determining and informing unit 115 judges if the radio wave strength “L” is out of range or not. The process proceeds to step 203 if the radio wave strength is out of range. On the other hand, the process terminates if the radio wave strength is not out of range.

10 Step 203:

The locking unit 118 instructs stopping the image from being displayed and an output operation from being outputted to the display controller 116 and input controller 117, respectively. The process then proceeds to step 204.

Step 204:

15 The display controller 116 stops the output of the image to the first display unit 111, and the input controller 117 invalidates the input operation of the user from the first input unit 112. Then, the process terminates.

Thus, according to the first embodiment, the radio field strength detector 114 judges if the radio communication with the information terminal
 20 120 is enabled or not at a predetermined time interval. If the radio field strength detector 114 judges that the radio communication is out of range and therefore the information terminal 120 is unable to communicate with the information processing apparatus 110 by radio, the display of an image outputted from the first display unit 111 and user input operation from the first
 25 input unit 112 provided in the information processing apparatus 110 are invalidated.

Therefore, if the units fail in communication with each other while the

information processing apparatus 110 is installed in a specified place and the information terminal 120 is being carried (transported), an operation for the surreptitious reading, the falsifying and/or the erasing of data at the information processing apparatus 110 side can be prevented. If the
5 information processing apparatus 110 itself is stolen, the internal data thereof can be protected.

In the first embodiment, in the combination of the information processing apparatus 110 and information terminal 120, if the units fail in communication with each other, the display and the input of the information
10 processing apparatus 110 are stopped (invalidated).

In a case where the information terminal 120 side is provided with a radio field strength detector 125, an out-of-range determining and informing unit 126, a locking unit 127, a display controller 128 and an input controller 129, and both sides (the information processing apparatus 110 and the information
15 terminal 120) fail in communication with each other, the first embodiment may be also designed to stop both the display and the input of a user's operation at the information terminal 120.

In such a system, if the portable information terminal (image display device) 120 is lost or stolen, an operation for the surreptitious reading,
20 falsifying and/or erasing of data can be also prevented.

In the first embodiment, when there is a failure in communication between the information processing apparatus (main controller) 110 and the information terminal (image display device) 120, the first embodiment is designed to stop display and input. As shown in Fig. 1B, the information
25 processing apparatus 110 or the information terminal 120 may be provided with a GPS receiver as a location detector 134 or 137. The display may be stopped and the input may be invalidated if the position that is measured by the GPS

receiver is out of a specified range.

In this case, too, the display and input can be stopped in the apparatus that is provided with the GPS receiver, or in the other apparatus that is not provided with the GPS receiver.

5 In the first embodiment, if there is a failure in communication, the first embodiment is designed to stop the display and input in the midst of a process. The first embodiment may be also designed not to start if a third party attempts to start a particular operation by using other starting means.

Second Embodiment

10 Fig. 3A is a block diagram of an information processing system according to a second embodiment of the present invention.

An information terminal 3100, which is a first radio communication apparatus, includes a function selector 3101, a password input unit 3102, and a transmitting unit 3103.

15 The function selector 3101 has a function of a locking operation, an unlocking operation, or setting a password according to the user's instruction.

Herein, the object of the locking or unlocking operation is to unlock or lock the operation of an information processing apparatus 3200 which is a second radio communication apparatus. Similarly, the password is used for
20 unlocking the operation of the information processing apparatus 3200.

The password input unit 3102 receives an input of a password from the user.

The transmitting unit 3103 transmits the signal that is generated in at least one of the function selector 3101 and the password input unit 3102 to the
25 information processing apparatus 3200 by a radio wave.

A receiving unit 3201 of the information processing apparatus 3200 receives the radio wave signal that is transmitted from the information

terminal 3100.

A display unit 3202 of the information processing apparatus 3200 displays data such as an image including a moving image, a still image and text to the user. An input unit 3203 accepts an input operation by the user of
5 the information processing apparatus 3200.

A processing unit 3204 processes the operation signal that is generated by the input operation of the user in the input unit 3203, and displays the result of processing in the display unit 3202.

A display controller 3205 controls whether to stop or start the display of
10 the image or other data that is output by the processing unit 3204 according to the instruction of a locking unit 3210 or an unlocking unit 3211 in the display unit 3202.

An input controller 3206 makes the user's input operation in the input unit 3203 valid or invalid depending on the instruction of the locking unit 3210
15 or the unlocking unit 3211.

A function determining unit 3207 judges (determines) whether the data that is received in the receiving unit 3201 is either the function of locking or unlocking operation or the function of setting the password. Accordingly, the determining unit 3207 instructs that the locking or the unlocking of the
20 operation of the information processing apparatus 3200 be performed or that a password is to be set to the locking unit 3210, the unlocking unit 3211, or password setting unit 3209, respectively. If the instructed function is unlocking, the received password and the content in the password memory 3208 are collated, and when matched, unlocking of the operation of the information
25 processing apparatus 3200 is instructed to the unlocking unit 3211.

Receiving this instruction, the unlocking unit 3211 instructs unlocking of the operation to the display controller 3205 and input controller 3206, and

unlocks the display unit 3202 and input unit 3203.

If the password is not matched, locking of the operation is instructed to the locking unit 3210.

Receiving this instruction, the locking unit 3210 instructs locking of the operation to the display controller 3205 and input controller 3206, and locks the display unit 3202 and input unit 3203. When a locking function is instructed, the display unit 3202 and input unit 3203 are locked.

The password memory 3208 stores the password which is necessary for unlocking the operation by the unlocking unit 3211.

The password setting unit 3209 changes the content, that is, the password stored in the password memory 3208, according to the instruction of the function determining unit 3207.

In the information processing system of the second embodiment having such a configuration as described above, the operation when the information processing apparatus 3200 receives the data that is transmitted from the information terminal 3100 is explained according to the flowchart shown in Fig. 4.

Step 401:

The receiving unit 3201 receives data, for example, "D" that is transmitted by radio communication from the information terminal 3100, and the process then proceeds to step 402.

Step 402:

The function determining unit 3207 judges if the function type of data "D" is for setting a password or not, and if Yes, password "P" is taken out from data "D", and the process then proceeds to step 403. On the other hand, if the function determining unit 3207 judges that the function type of data "D" is not for setting a password the process then proceeds to step 404.

Step 403:

The function determining unit 3207 instructs that password “P” be registered to the password setting unit 3209, the password setting unit 3209 stores the password in the password memory 3208 according to the instruction,
5 and the process is then terminated.

Step 404:

The function determining unit 3207 judges if the function type of data “D” is for a locking of the operation the information processing apparatus 3200 or not, and if Yes, the process then proceeds to step 405. On the other hand, if
10 the function determining unit 3207 judges that the function type of data “D” is not for a locking operation, the process then proceeds to step 406.

Step 405:

The locking unit 3210 instructs that the operation of the information processing apparatus 3200 to the display controller 3205 and the input
15 controller 3206, the display controller 3205 and the input controller 3206 stop display and input of the display unit 3202 and the input unit 3203 according to the instruction, respectively, and the process is then terminated.

Step 406:

The function determining unit 3207 takes out password “P” from data
20 “D”, compares (verifies) password “P” and the contents in the password memory 3208, and the process then proceeds to step 407.

Step 407:

When the password is matched (verified), the process then proceeds to step 408, or otherwise the process is terminated if the password is not matched.

25 Step 408:

The function determining unit 3207 instructs that the operation of the information processing apparatus 3200 be unlocked to the unlocking unit 3211.

Accordingly, the unlocking unit 3211 instructs that the operation be unlocked to the display controller 3205 and the input controller 3206.

The display controller 3205 starts display of the display unit 3202 and the input controller 3206 starts input of the input unit 3203 according to the
5 instruction, and the process is then terminated.

Thus, according to the second embodiment, the user, from the information terminal 3100, sends the operation of locking or unlocking the operation of the information processing apparatus 3200 or setting of a password by radio communication to the information processing apparatus 3200. After
10 judging the function by the function determining unit 3207, the process, according to the judgment result is realized by the locking unit 3210, the unlocking unit 3211, or the password setting unit 3209. Therefore, when the information terminal 3100 is carried by the user and the information processing apparatus 3200 is installed at a place which is remote from the user, or if the
15 information processing apparatus 3200 is lost or stolen, the operation of the information processing apparatus 3200 can be locked or unlocked, or the password for operating the information processing apparatus 3200 can be set by the user from the information terminal 3100. The second embodiment therefore avoids the ill-willed operation by a third party for the surreptitious
20 reading, falsifying or erasing the data in the information processing apparatus 3200.

In the second embodiment, the password which is stored in the password memory 3208 is used for unlocking the operation of the information processing apparatus 3200 from the information terminal 3100, which is the
25 first radio communication apparatus.

The same password may be also used for unlocking the operation of the information processing apparatus 3200, which is the second radio

communication apparatus.

Alternatively, as shown in Fig. 3B, in addition to the function selector 3101 and the password input unit 3102, a display unit 3104 for displaying the image, an input unit 3105 for accepting a user's general input operation, and a
5 processing unit 3106 for processing these signals may be also provided in the information terminal 3100.

Third Embodiment

Fig. 5 is a block diagram of an information processing apparatus according to a third embodiment of the present invention.

10 In Fig. 5, a display unit 501 is a CRT, an LCD or the like, and the display unit 501 displays specified images or text.

An input unit 502 includes a keyboard and a mouse, and accepts a user's input operation.

A location detector 503 is connected to a GPS receiver or incorporates a
15 GPS receiver, the location detector 503 calculates the present location of the information processing apparatus of the third embodiment at predetermined time intervals, and outputs the present position.

The output data of the location detector 503 contains latitude, longitude, altitude, and other information, but, for the convenience of description in the
20 third embodiment, only the latitude and longitude are described as being used, and the latitude and longitude expressed to the third decimal point.

An range memory 504 stores the usable range of the information processing apparatus in the third embodiment of the present invention in terms of latitude and longitude.

25 The content can be changed by proper means (not shown). An operation controller 505 judges if the output data of the location detector 503 is within a predetermined range of data that is stored in the range memory 504 or

not. The operation controller 505 informs the judgment result to a locking unit 506 or an unlocking unit 507.

If the present position of the information processing apparatus of the third embodiment is out of a specified range, an instruction is given to the locking unit 506 to stop the operation of a processing unit 509, and the information processing apparatus is disabled. Otherwise, an instruction is given to the unlocking unit 507, and the operation of the processing unit 508 is started so that the information processing apparatus is enabled.

A processing unit 508 processes according to the input of a user's operation from the input unit 502, and outputs, if necessary, images including a moving image, a still image, and/or text to the display unit 501.

The operation of the processing unit 508 is stopped or started by the instruction from the locking unit 506 or the unlocking unit 507.

In the information processing apparatus of the third embodiment having such a configuration as described above, the operation of the information processing apparatus after the location detector 503 detects the present position (of the information processing apparatus) is explained according to the flowchart shown in Fig. 6.

Step 601:

The location detector 503 detects the present position of the information processing apparatus as, for example, "P", and the process then proceeds to step 602.

Step 602:

The operation controller 505 judges if the present position of the information processing apparatus is within the predetermined range that is stored in the range memory 504 or not, and if the present invention is within the predetermined range, the process then proceeds to step 603. On the other

hand, if the operation controller 505 judges that the present position of the information processing apparatus is out of the range, the process then proceeds to step 605.

Step 603:

5 The unlocking unit 507 checks if the processing unit 508 is stopped or not, and if the processing unit 508 is stopped, the process then proceeds to step 604. On the other hand, if the processing unit 508 is operating, the process is then terminated.

Step 604:

10 The unlocking unit 507 instructs a start of the operation of the information processing apparatus to the processing unit 508, and the process is then terminated.

Step 605:

15 The locking unit 506 checks if the processing unit 508 is operating or not, and if the processing unit 508 is operating, the process then proceeds to step 606. On the other hand, if the operation of the processing unit 508 is stopped, the process is terminated.

Step 606:

20 The locking unit 506 instructs stopping of the operation of the information processing apparatus to the processing unit 508, and the process is then terminated.

For example, suppose the information processing apparatus of the third embodiment is used in an office. Suppose also that the office is located at an east longitude of 135 degree 34.350 min. and a north latitude of 34 degree
25 44.550 min., and that the range memory 504 is supposed to store the data of "east longitude of 135 degree 34.300 min. to 135 degree 34.400 min., and north latitude of 34 degree 44.500 min. to 34 degree 44.600 min." Then, the

information processing apparatus operates normally in the office, but if the information processing apparatus is taken out of the office by an ill-willed third party and moved to a place several hundreds meters away, the information processing apparatus does not work, and therefore, any subsequent illegal uses
5 of the information processing apparatus can be prevented.

Thus, according to the third embodiment, the location detector 503 detects the present position of the information processing apparatus at predetermined time intervals, and the information processing apparatus is either operated when within a predetermined range or is stopped from
10 operating if the information processing apparatus is taken beyond the predetermined range. The third embodiment therefore prevents the removal of the information processing apparatus by a third party, or any surreptitious operations for reading, falsifying and/or erasing of data in the information processing apparatus.

15 In the third embodiment, depending on the output of the location detector, examples of changing from an operating state to a stopped state, or from the stopped state to the operating state are shown. Alternatively, if the output of the location detector is out of the predetermined range, the location detector may be designed so as to control the power source of the information
20 processing apparatus to prohibit the information processing apparatus from being turned on.

As described herein, according to the present invention, in the system comprising apparatuses for mutual radio communication, if one apparatus is judged to be out of a predetermined range by the measurement of a received
25 radio wave strength or detection of present position of this apparatus by GPS, the operation of this apparatus is locked. Accordingly, the system, apparatuses and methods of the present invention prevent a third party's mischievous

operation for reading, falsifying or erasing data surreptitiously. Further, in the system comprising apparatuses for mutual radio communication, from the apparatus of the user's side, a locking or unlocking of the operation and setting of password of the other apparatus can be instructed. The above-described
5 system similarly prevents an operation for reading, falsifying or erasing data surreptitiously.

Moreover, in an independent apparatus which incorporates a GPS receiver, if the apparatus is out of a predetermined range, the operation thereof is locked, or the starting of the apparatus is stopped. Thus, if the apparatus is
10 stolen and moved to a remote place, the possibility of a third party's surreptitious operation for reading, falsifying or erasing data can be avoided.